Seek

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Shorts

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New initiative highlights successes, future of K-State innovations

Kansas State University researchers have long had their noses to the grindstone to improve the well-being of Kansans. Their innovations have — and continue to — address challenges in agriculture, biodefense, personal and financial health, business, infrastructure, education, basic science and more.

To help Kansans — and the world — learn more about K-State research, the Influence Tomorrow initiative has been created to explore our mission to find answers to important questions and to apply what K-State researchers know to solve both current and future problems.

Since K-State's founding in 1863, the university has transformed fundamental research and technology into real-world solutions. Recent successes include developing disease-resistant wheat varieties, engineering a hydrogel to study and treat cancer, protecting piglets from a devastating disease, and designing unmanned aircraft systems to study and improve crops.

Peter Dorhout, vice president for research, said leading K-State research endeavors is a worthy challenge. Dorhout believes K-State's past, present and future are fused together in a quest to better the world by asking new questions and not accepting the easy path.

"Kansas State University is at the forefront of discoveries that affect lives — from our dinner tables to our hospitals — and as long as there are questions that need answers, we'll continue leading the way," Dorhout said.

This approach requires vast resources, but K-State leaders and researchers realize the importance of efficiency and are successful in obtaining outside support. Researchers received more than 1,400 grants last year totaling $139.3 million. The university also is building more collaborations with industry, with K-State projects funded by industry growing by 80 percent in the last five years. This funding helps the university's researchers put their ideas into practice and builds pipelines of talent for corporate partners. Across the entire research enterprise, K-State contributes more than $190 million to the local and state economy through research expenditures.

Visit *k-state.edu/influence-tomorrow* to continue exploring the power of K-State research.

2018 RESEARCH SHOWCASE

Showcasing research, sparking industry collaboration

According to the Information Technology & Innovation Foundation, Kansas ranks third in the country in the share of university research supported by industry. Kansas State University has a long history of economic engagement and industry collaboration, and the university's upcoming 2018 Research Showcase aims to foster continued growth.

The May 16 event at K-State Olathe will highlight research capabilities, facilities and resources for prospective partners in business and industry. Exhibitors will demonstrate the wide breadth of K-State expertise and how K-State researchers can help industry meet research and development goals, solve problems, develop long-term strategies and more.

K-State is offering the event in the Kansas City region for a second year following a successful event in 2017.

"Companies in the Greater Kansas City region showed us last year that they are hungry for collaboration and innovation with talented researchers," said Peter Dorhout, vice president for research. "Industry benefits from academic partners who help develop and advance the technologies of tomorrow so that they can be brought to a commercial market and used to improve lives."

K-State research projects funded by industry have grown by 80 percent in the last five years, and the university is eager to continue to forge strategic, enduring alliances with industry partners.

Industry registrations for the showcase are welcome through May 1 at ***k-state.edu/researchshowcase***. Information about exhibitors will be available in the Research Showcase module of the K-State mobile app.

A vested discovery: R&D 100 Award for wearable radiation detection technology

A Kansas State University research team has won a 2017 R&D 100 Award for a vest specially designed to contain devices that detect illicit nuclear material. This is the team's fifth award since 2005 for one of the year's 100 top technologies, as selected by R&D magazine.

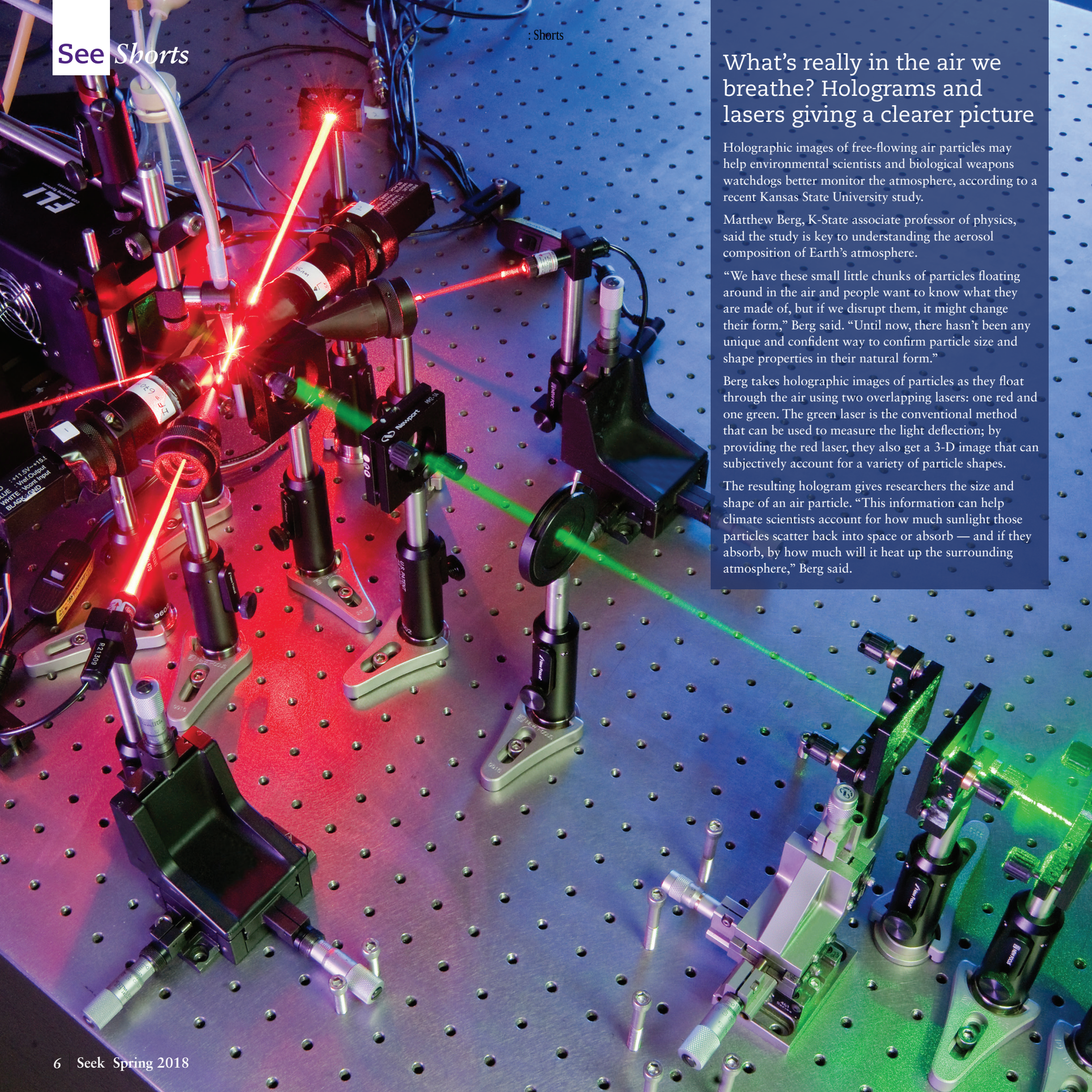
Douglas McGregor, university distinguished professor of mechanical and nuclear engineering, led the team of K-State, industry and government contributors in developing a vest designed to contain multiple gamma ray and neutron detectors. The garment allows the wearer to blend into the environment while detecting dangerous radiation, and the general direction of its origin, with wired or wireless small, lightweight, modular detectors that operate for weeks at a time.

The coveted R&D 100 Award emphasizes the bringing of inventions from their initial concepts on the blackboard, through research and development, and into the commercial marketplace.

"A lot of inventions are good but they never go past publishing a paper," McGregor said. "Our invention is in commercialization. I enjoy the pure sciences, but I keep my eye on practicality."

The project was funded by the Defense Threat Reduction Agency. Contributors included Radiation Detection Technologies Inc.; K-State's Semiconductor Materials and Radiological Technologies Laboratory, or S.M.A.R.T. Lab, and Electronics Design Laboratory; and Alion Science and Technology Corporation. S.M.A.R.T. Lab faculty and graduate students designed the detectors; Electronic Design Laboratory staff and students built the electronics; Radiation Detection Technologies integrated the products; and Alion produced the communications protocols and software, along with McGregor's students.

The project group also worked with Emily Pascoe, a K-State doctoral student in the apparel, textiles, and interior design department. Pascoe's expertise ensured that the team used the best fabric, notions and construction methods for the vest.



What's really in the air we breathe? Holograms and lasers giving a clearer picture

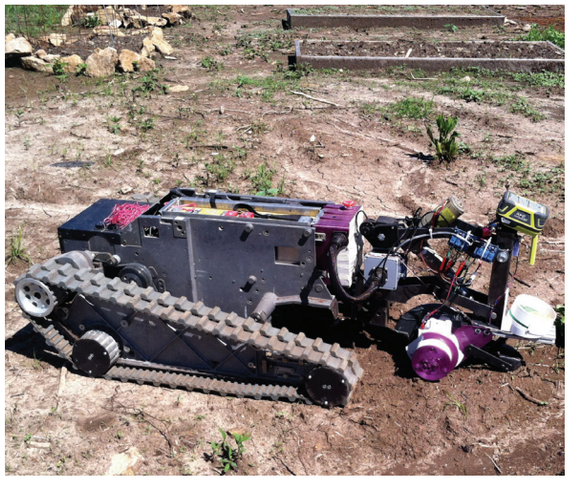
Holographic images of free-flowing air particles may help environmental scientists and biological weapons watchdogs better monitor the atmosphere, according to a recent Kansas State University study.

Matthew Berg, K-State associate professor of physics, said the study is key to understanding the aerosol composition of Earth's atmosphere.

"We have these small little chunks of particles floating around in the air and people want to know what they are made of, but if we disrupt them, it might change their form," Berg said. "Until now, there hasn't been any unique and confident way to confirm particle size and shape properties in their natural form."

Berg takes holographic images of particles as they float through the air using two overlapping lasers: one red and one green. The green laser is the conventional method that can be used to measure the light deflection; by providing the red laser, they also get a 3-D image that can subjectively account for a variety of particle shapes.

The resulting hologram gives researchers the size and shape of an air particle. "This information can help climate scientists account for how much sunlight those particles scatter back into space or absorb — and if they absorb, by how much will it heat up the surrounding atmosphere," Berg said.



USDA-funded robotic farming project could increase world's food supply

Could robotic farming be the solution for meeting the food requirements of a world population of an estimated 9 billion people by 2050? This pressing issue is being taken on by a team of researchers at Kansas State University whose aim is to increase arable land acreage considered too steep for farming with conventional equipment.

The U.S. Department of Agriculture's National Robotics Initiative 2.0: Ubiquitous Collaborative Robots has awarded the team, led by Dan Flippo, assistant professor of biological and agricultural engineering, nearly $1.2 million for the project.

The project is exploring the use of multiple small robots to farm highly sloped land. The robots, the size of a common wheelchair, will work in groups to accomplish fieldwork by unconventional means. Strap-on hardware modules will be designed to allow the small vehicles to plant, manage and harvest wheat on hills with slopes as great as 55 percent, or 30 degrees.

The small autonomous vehicle farming concept is brand-new, allowing engineers and scientists to rethink cropping operations. It has the potential of not only increasing yield for an enlarging population but to also do so in a sustainable way that will allow continued feeding of the world.

Joining Flippo in the K-State endeavor are Stephen Welch, professor, and Antonio Asebedo, assistant professor, both in agronomy; Arnaud Temme, associate professor of geography; and Sanjoy Das, associate professor of electrical and computer engineering.

Chomp on this:
Alligators eat sharks

American alligators on the Atlantic and Gulf coasts have been eating small sharks and stingrays, according to a study by a Kansas State University researcher. This is the first scientific documentation of a widespread interaction between the two predators.

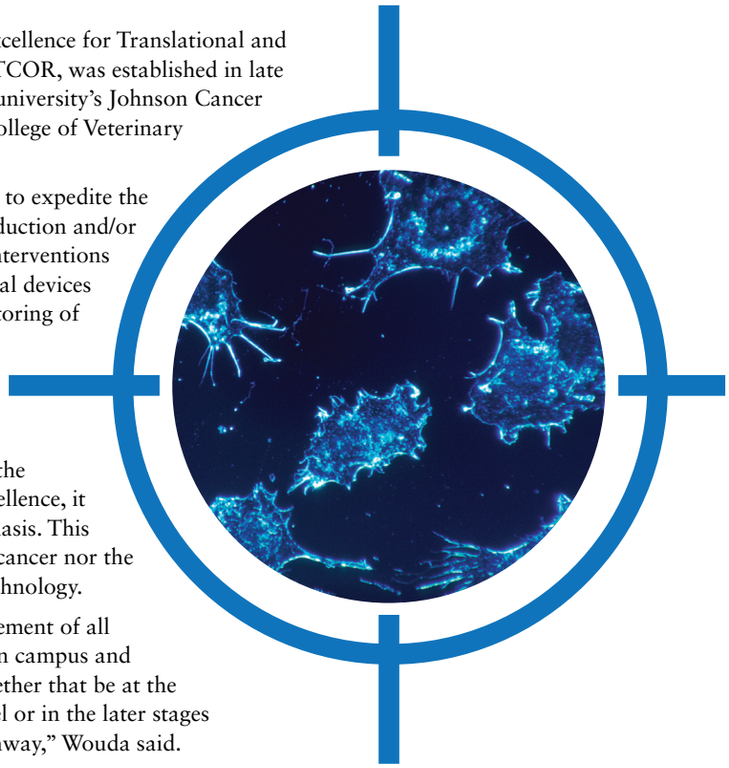
James Nifong, postdoctoral researcher with the Kansas Cooperative Fish and Wildlife Unit at K-State, and Russell Lowers, wildlife biologist with Integrated Mission Support Services at Kennedy Space Center, conducted the cooperative research as part of larger research of freshwater river systems and food web dynamics. The researchers published the alligator diet research in the Southeastern Naturalist.

Despite the freshwater and saltwater differences, Nifong said it is fairly common for sharks and rays to share the water with alligators. Many sharks and rays can swim into freshwater where opportunistic alligators can't pass up a good meal. Although alligators don't have salt glands like true crocodiles, they are resourceful as they travel between freshwater and marine habitats.

Cancer is target of university's newest center of excellence

The College of Veterinary Medicine at Kansas State University has a new center of excellence that focuses on improving the diagnosis, management and treatment of both human and animal cancers.

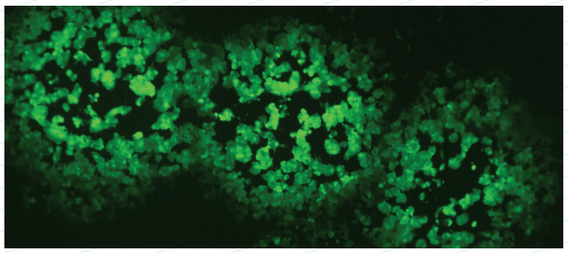
The Kansas State University Center of Excellence for Translational and Comparative Oncology Research, or CETCOR, was established in late 2017 through start-up funding from the university's Johnson Cancer Research Center and support from the College of Veterinary Medicine.



"The overriding objective of CETCOR is to expedite the preclinical and clinical development, production and/or licensure of novel or improved medical interventions — drugs, immunotherapeutics and medical devices — for the treatment, diagnosis and monitoring of both human and animal cancers," said Raelene Wouda, assistant professor of oncology in the college's clinical sciences department.

According to Wouda, a unique aspect of the center is that, unlike many centers of excellence, it does not possess a solitary research emphasis. This center does not focus on a single type of cancer nor the development of a single novel drug or technology.

"Our group aims to facilitate the advancement of all cancer-associated research taking place on campus and within the wider K-State community, whether that be at the basic physiologic and pharmacologic level or in the later stages of the therapeutic drug development pathway," Wouda said.



Compound in red wine, chocolate prevents smallpox virus cousins from replicating

Are chocolate and red wine health foods?

Could be, according to Kansas State University researchers.

"Resveratrol is a small, natural compound in many plants like grapes, cocoa beans, peanuts and blueberries," said Shuai Cao, postdoctoral researcher studying the effects of resveratrol on viruses. "Our recent study found that high concentrations of resveratrol — higher than anything you may find in food naturally — prevent poxviruses from replicating in human cells."

Cao; Anil Pant, doctoral student in biology; Zhilong Yang, assistant professor of biology; and their collaborators at the Centers for Disease Control and Prevention have published "Suppression of Poxvirus Replication by Resveratrol" in Frontiers in Microbiology.

"Resveratrol can be chemically synthesized or extracted from fruits," Pant said. "Our research may be a steppingstone to using resveratrol as a complementary treatment for viruses during a time of growing concern over drug resistance."

The researchers added resveratrol at varying intensities to human cell cultures infected by vaccinia virus, a cousin to the highly dangerous variola virus that causes smallpox. Used as the vaccine to eradicate smallpox, vaccinia virus provides a good model of how viruses work without the danger, Cao said. The cell cultures with high levels of resveratrol prevented vaccinia from replicating in the early stages of the viral infection, which stops the virus from spreading.

"In order for a poxvirus to infect a host, it has to first enter a cell and make a lot of copies of its genome inside the host cell," Pant said. "Our research has shown that resveratrol inhibits vaccinia virus from making copies of its DNA and genome."

The Kansas State University researchers recorded resveratrol's success with vaccinia and collaborated with researchers at the CDC to perform similar experiments with monkeypox, a contagious and deadly virus to humans that has caused periodic disease outbreaks in Africa. Resveratrol had the same effect with monkeypox, which means that it has a good chance of inhibiting all poxviruses, Cao said.